We Claim:

1. A method for controlling an engine having an exhaust with an emission control device capable of storing NOx during lean operating conditions, and converting at least a portion of said NOx during stoichiometric or rich operating conditions, the method comprising:

operating the engine to produce a lean exhaust gas mixture fed to the emission control device;

calculating an amount of NOx stored in the device based on operating conditions;

determining a NOx storage limit value, said value determined as a function of device temperature and an amount of oxygen storage capacity of the device; and

ending said engine operation producing said lean exhaust gas mixture when said amount of NOx stored reaches said limit value.

2. The method of claim 1 wherein said operation is ended even if said device is still capable of storing NOx at high efficiency.

3. The method of claim 1 further comprising, after said ending, operating the engine to produce a rich air- fuel exhaust ratio, with said rich air-fuel ratio selected to provide a level of reluctant dependent on said device temperature and said amount of oxygen storage capacity of the device.

4. The method of claim 1 wherein said emission control device capable of storing NOx is a three-way catalyst including cerium and barium.

5. The method of claim 1 wherein said operating conditions include one or more of a feedgas flow rate, a feedgas NOx concentration, a UEGO sensor reading upstream from an emission control device capable of storing NOx, a UEGO sensor reading downstream from said emission control device, a HEGO sensor reading upstream from said emission control device, a HEGO sensor reading downstream from said emission control device, a NOx sensor reading upstream from said emission control device, and a NOx sensor reading downstream from said emission control device.

6. The method of claim 1 wherein said amount of oxygen storage capacity is determined from the difference in switch times during a rich operating condition and a lean operating condition transition.

7. The method of claim 1 wherein said device temperature is estimated using a temperature model.

8. The method of claim 1 wherein said device temperature is estimated using a thermocouple.

9. A method for controlling the NOx emissions from an engine having an exhaust with an emission control device capable of storing NOx during lean operating conditions, and converting at least a portion of said NOx during stoichiometric or rich operating conditions, the method comprising:

operating the engine to produce a lean exhaust gas mixture fed to the emission control device;

calculating an amount of NOx stored in the device based on operating conditions;

determining a first NOx storage limit value, said value determined as a function of device temperature and an amount of oxygen storage capacity of the device;

determining a second NOx storage limit value based on an operating condition and;

ending said engine operation producing said lean exhaust gas mixture when the amount of NOx stored reaches either the first or second storage limit.

10. The method of claim 9 wherein said operation is ended even if said device is still capable of storing NOx at a high efficiency.

11. The method of claim 9 wherein said operation is ended even if said device is still capable of storing NOx at the desired predetermined lean storage efficiency.

12. The method of claim 9 further comprising, after said ending, operating the engine to produce a rich air-fuel exhaust ratio, with said rich air-fuel ratio selected to provide a level of reluctant dependent on said device temperature and said amount of oxygen storage capacity of the device.

13. The method of claim 9 wherein said emission control device includes a diagnostic system that controls the duration of lean storage periods in order to achieve a desired lean storage efficiency designed to regulate the NOx emissions from the vehicle during both the lean storage periods and the rich purge periods.

14. The method of claim 9 wherein said diagnostic system controls the duration of lean storage periods using one or more of feedgas flow rate, feedgas NOx concentration, NOx sensor reading upstream from an emission control device capable of storing NOx, a HEGO sensor upstream from said emission control device, a HEGO sensor downstream from said emission control device, a UEGO sensor upstream from said emission control device, a UEGO sensor downstream from said emission control device, and NOx sensor reading downstream from said emission control device capable of storing NOx.

15. The method of claim 9 wherein said emission control device capable of storing NOx is a three-way catalyst including cerium and barium.

16. The method of claim 9 wherein said amount of oxygen storage capacity is determined from the difference in switch times during a rich operating condition and a lean operating condition transition.

17. The method of claim 9 wherein said device temperature is estimated using a temperature model.

18. The method of claim 9 wherein said operating conditions include one or more of a feedgas flow rate, a feedgas NOx concentration, a HEGO sensor upstream from an emission control device capable of storing NOx, a HEGO sensor downstream from said emission control device, a UEGO sensor upstream from said emission control device, a UEGO sensor downstream from said emission control device, a NOx sensor reading upstream from said emission control device, and a NOx sensor reading downstream from said emission control device capable of storing NOx.

19. The method of claim 9 wherein the second limit value is based on satisfying a predetermined lean storage efficiency.

20. A computer storage medium having instructions encoded therein for controlling an engine having an exhaust with an emission control device capable of storing NOx during lean operating conditions, and converting at least a portion of said NOx during stoichiometric or rich operating conditions, said medium comprising:

code for operating the engine to produce a lean exhaust gas mixture fed to the emission control device;

code for calculating an amount of NOx stored in the device based on operating conditions;

code for determining a NOx storage limit value, said value determined as a function of device temperature and an amount of oxygen storage capacity of the device; and

code for ending said engine operation producing said lean exhaust gas mixture when said amount of NOx stored reaches said limit value.

21. The medium of claim 20, wherein said code for controlling said engine further comprises code for determining a NOx storage limit value based on a desired predetermined lean storage efficiency and ending said engine operation producing said lean exhaust gas mixture when the amount of NOx stored reaches either said NOx storage limit value determined as a function of device temperature and an amount of oxygen storage capacity of the device, or said NOx storage limit value based on a desired predetermined lean storage efficiency.